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An

Inaugural Essay

on the phenomena of

Suspended Animation

Philadelphia

1818.

Introduction

The history of our subject is short, no exertions were made, until the commencement of the 18 century, when in Holland this interesting call upon policy as well humanity was properly regarded and successfully carried into execution; in Europe as well as in America, it has awakened the attention and interested the feelings of mankind, numerous societies have been established under the patronage of the great* and with the assistance of the learned: even the savages of Algiers have listened to the calls of humanity, and a society has been formed for this benevolent purposes: but to England are we principly indebted, whilst her army and navy were dealing death and destruction to more than half the civilized world, a humbler class of her citizens were busily engaged, in investigating

* The present King of England is the patron of the Humane Society of London.

the means of restoring suspended animation; how delightful the contrast; with what heartfelt satisfaction, must the Humane society of London have viewed 1300* persons, rescued from the sting of terrors.

If we are struck with admiration at the productions of genius, in which the artist captivates us by an imitation of nature, and teaches canvas or marble to resemble animation, with what rapture must enlarged and benevolent minds view the corporeal faculties actually restored, the cheeks again blooming with undiminished lustre, and the countenance replete with gratitude to those who have been the happy instruments of resuscitation!

Upon the imperfections of my essay, I have but one observation to make, the time allowed for its pre-

* See appendix no 4 to Dr. Finch's sermon

duction was passed "in sickness and in sorrow."

My subject naturally divides it self, into the proximate cause of death, and the means of restoring animation when suspended; the signs by which we determine the actual death of the animal, are so uncertain we shall not attempt to investigate them.

The proximate cause of death 4

A variety of opinions have been advanced, as to the seat of that principle, or quality we call life; whether it resides in the blood, brain, nerves or stomach, or is the result of organization, or the effect of stimuli, is to me unknown; that all animals and vegetables which live are organized and require stimuli to support this life, none will deny, but we will not entangle our selves in this eternal subject of dispute, neither do we consider it necessary; to understand what this quality or principle is; to investigate the laws which govern life, the causes which interupt or destroy it, are all that is required for the successful practice of Medicine: by studying the principles of gravity, Newton unfolded the laws which govern the planetary

system, and until we more fully investigate the phenomena of life and death, we will arrive at no conclusions of practical importance.

Man was formed by his Creator to live in the atmosphere which surrounds him, deprived of that he languishes and dies; to ascertain the phenomena of suspended respiration I instituted the following experiments. viz.

Having procured a cat I passed a ligature round its trachea: upon opening the cavity of the thorax, the right side of the heart, with the superior and inferior cavæ were distended with dark colored blood, left side nearly empty; the lungs of a dark color; the heart continued to pulsate for 2 hours and was excitable for upwards of 5 hours; the blood vessels of the brain were loaded

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with a dark colored blood, but no extravasation was observed. similar appearances were observed after drowning, and it is only necessary to remark that no water was found in the lungs: we shall defer our conclusions for the present & proceed to examine the various opinions upon the proximate cause of death, from hanging drowning &c.

They have been arranged by Kite in his prize essay into

1st, That species of apoplexy which arises from an over distension of stomach.

2dly, The blood being rendered unfit for performing its offices, by want of the action of the air in respiration.

3dly, Water in the lungs: and

4thly, A contraction of the parts about the larynx, preventing the air from passing into or out of the lungs, and producing

death

death by

a. The enclosed air being rendered highly phlogisticated.

b. Suffocation, or a congestion of blood about the heart and lungs; or,

c Apoplexy.

Of the first of these opinions it is only necessary to observe that De Haen found no distention of the stomach in 13 dogs which he examined and Kites experiments upon kittens coincides with those of De Haen "for not one drop of water was found in any of their stomachs."

The opinion that death is produced by water in the lungs is also proved to be incorrect by experiments of others* as well as my self, for when animals are drowned in a coloured fluid none can be discovered in the lungs after death;

We shall not pause to examine the other

* vide C. Kites Essay
Dr. Oswalds inaugural dissertation

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opinions they are relevant to the popular doctrines of the day.

The most plausible opinion we have seen is that death is to be attributed to apoplexy, to test the truth of it the following experiments were performed by a graduate in this University; "the two carotids of a half grown dog were laid bare and firmly secured by ligatures; the external wound being now stitched up, the animal was set at liberty, 5 hours after no change having been produced on him by the operation, having the perfect use of all his senses and as lively as he was before the operation was performed) he was plunged under water, and confined below its surface, not allowing him to respire the least portion of air: his struggles and efforts to inspire were very strong, and continued for two minutes after which he became feeble,

Dr. Oswald of South Carolina.

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and was taken out dead in 3 minutes and 5 seconds. On dissection, the external surface of the brain appeared some what dark; very little blood was found in its vessels, which were but little more than half full of blood: the other experiment is as follows, "having secured the external and internal jugular veins of a half grown dog, he was set at liberty: in one hour and thirty minutes, the animal appeared drowsy, but respiration natural, with some increased fulness of pulse: in three hours, he appeared to desire sleep, and the blood vessels of the coats of the eyes were somewhat turgid. I left him lying on some straw at five in the afternoon, (the ligatures were put on at 10 in the morning) apparently better; at ten the next morning much better, and his apoplectic symptoms not so evident as they were the day

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before. At twelve on the same day he was plunged under water, ~~[illegible]~~ and confined below its surface during the whole time, not permitting him to have access to the external air. He struggled severely for two minutes, making frequent efforts to inspire. He now became very feeble, but still attempting to inspire, he died in 3 minutes. On dissecting him the blood vessels of the brain were very turgid, with extremely black blood; no extravasation occurred, but effusion had taken place in the ventricles: the lateral sinuses were traced to their termination in the jugulars, considerably distended, and the jugulars, above where the ligatures had been applied, were also much distended.

It appears from these experiments that notwithstanding the current of blood

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was interupted to the brain, the animal died in the usual time; and when it was prevented from returning by its usual spout or rather when it was all most entirely so, death was not accelerated.

The experiment of Professor Monro is equally conclusive.

"A dog was suspended by the neck with a cord; an opening having been previously made in the wind-pipe below the cord, so as to admit air into the lungs. In this state, he was allowed to hang 3 quarters of an hour, during which time, the circulation and breathing went on without being much interupted by the experiment. The cord being now shifted below the opening into the wind-pipe, so as to intercept the ingress of air into the lungs, and the animal being again sus-

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pended, was completely dead in a few minutes" no experiment could more decisive.

So early as the commencement of the 17th century Boyle proved by means of an air pump the necessity of air to animals, and that the actions of life ceased without a constant supply of this pabulum vitæ: The experiment of Hooke is equally conclusive; he "opened the thorax of a living animal, cut away his ribs and diaphragm, and took off the pericardium. He kept the dog alive above an hour, before the Royal Society, by blowing fresh air into his lungs with a pair of bellows. He picked the outer coat of the lungs with a slender point of a sharp penknife, and with a continued blast, made with a pair of double bellows, he kept the lungs always distended, and without motion; and it

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man is born (says the poet) but to die, and reasons, but to err, the verity of the opinion is exemplified in this subject, by the experiments of Boyle & Hooke and of Mayow and by the concurrent testimony of mankind, the air, as well as the plants and animals, which surround us, are necessary for our existence. this granted, and who will deny it? we need carry our thoughts, but one step further to arrive at truth. let us view for a moment, the apparatus of circulation, the right ventricle of the heart receives the blood of the venous system, and distributes it, through the lungs, here it comes in contact with the air of our atmosphere, and passes from a dark or venous color, to a bright red or arterial one, which is returned to the left ventricle by the pulmonary

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was observed, that while the lungs were thus kept distended with a constant supply of fresh air, the dog lay stile, his eyes were quick, and his breast beat regularly; but with leaving off blowing, and suffering the lungs to lie stile, the dog presently fele into dying convulsions, and as soon recovered again on renewing the blast, and supplying the lungs with fresh air." from all which he concludes that neither the motion of the lungs nor the cessation of them, nor the stoppage of the circulation through them was the cause of death, but a want of a regular supply of air.

With these experiments before them, the physiologists of the present day have wandered in darkness and doubt, until the coruscation of the genious of Bichat illumined the dark and intricate subject;

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veins to the left ventricle; from which it is distributed by the aorta, to all parts of the body communicating health and strength: but reverse the state of the animal, placed under water, his trachea secured by a ligature, destroy his spinal marrow, or prevent the mechanical or chemical actions of the lungs in any way; and instead of the bright arterial blood returned by the pulmonary veins, to diffuse life and strength, you will have a dark coloured fluid (the venous blood) which will carry death to every part of the system.

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Having attempted to explain the proximate cause, we proceed to the second division of our subject, the means of restoring suspended respiration or animation.

To adapt our remedial resources to the ever varying state of the system, in ordinary diseases, is the language of American physicians: a class of men who have received the sceptre of reason from the hand of truth, who have infused the republican spirit of our government into medicine unshackled by the trammels of nosology, they prescribe for the various forms of morbid excitement; few parts of our profession require this American practice more than our present subject: we can not elucidate our meaning upon <u>the necessity of adapting our remedies to feeble grades of life</u> than by relating

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the following case.

Whiting an englishman aged about 25 years was admitted into the Pennsylvania Hospital, during last winter, he stated that during a very cold night, he walked to his fathers who lived on the other side of the Schuylkill - on his way out he got his feet wet, on his arrival his shoes and stockings were removed and his feet placed in warm water; after remaining in the water for 10 or 15 minutes he removed them and found both feet and legs as high as the calves covered with black blisters: in this state he was admitted a blister was prescribed to the affected part by Dr. Dorsey the attending Surgeon, extensive sloughs separated, which so mutilated his feet, as to render amputation necessary; had heat in this case been gradually applied the prob-

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We shall proceed to relate the various means which have been found most successful in the hands of the Humane Society

The patient should be immediately stripped of wet cloathes, and warm covering substituted, he should be conveyed to a warm room, or during summer exposed to the sun. "I never could (says Meak) inflate the lungs so long as he was in a lifeless state; but no sooner was the body heated with a warming pan, than every attempt to distend the lungs was attended with amazing good effects".

In all our attempts it is of the first importance, to produce excitement in the skin, by heat, & by frictions with salt, with hartshorn and above all

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with decoction of cantharides in spirits of turpentine, which should be rubbed on all parts of the body.

After having produced warmth on the surface, or whilst frictions are employed, we should endeavour to distend the lungs with common air, and for this purpose a flexible tube adapted to a bellows will answer very well; it has been recommended by Hunter (Philosophical Transactions) to introduce the fumes of volatile alkali. Stimuli of such kinds as may be most convenient should by means of another tube be passed into the stomach and stimulating injections should be thrown into the rectum.

Of the various of means which have presented to the mind of man, for the relief of the ~~[illegible]~~ maladies to which

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he is subject, few have claimed his more serious attention than electricity, and I am sorry to add, from which he has derived so little positive good.

It has been warmly recommended by the distinguished Dr. Fothergill and other members of the Humane Society, but we anticipate much more benefit to our patients, by the gradual and general use of stimuli.

We are directed to increase our exertions, or rather our remedies, upon the first appearances of life, we consider this highly incorrect, our remedies should be decreased or discontinued upon the restoration of ~~animation~~; light food, rest, & laxatives, should be substituted; it has been well observed by a distinguished medical writer, "that patients in this state should be carefully

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"watched for the latent "scintillula" will often quickly disappear."

The recoveries from drowning are frequently followed by acute inflammation, which should be relieved by general, and local bleeding, purges and the usual antiphlogistic treatment.

We shall conclude by quoting the popular directions upon this subject by the Humane Society.

I The body should not be rolled on the ground, or over a barrel, nor lifted up by the heels, or in any other way roughly handled, or violently shook; but be removed to a comfortable place, lying as on a bed with the head a little raised, in as natural a position as possible.

II The body well wiped with a cloth, should be placed in a warm bed or blanket; but not too near a large fire. Bottles of hot

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water should be laid to the bottom of the feet, joints of the knee, and under the arm pits. A warming pan moderately heated, or hot bricks wrapped in cloths, should be rubbed on the body, particularly along the back. The natural warmth of a healthy person, especially a child, lying close to the body, has been found very efficacious. The room should be kept open and airy, with few persons in it. The skin of an attendant, or skin of a sheep fresh killed and warm, may be used to advantage. Should the accident happen in the neighbourhood of a warm bath, brew-house, glass-house, saltern, soap manufactory, or any fabric where warm lees, ashes, embers, grains, sand &c can be easily, it will be very proper to place the body in any of these, moderated to a degree of heat little exceeding that of a healthy person.

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III The body being placed in one or other of the above advantageous situations, various stimulating means should be immediately employed. The most efficacious are, blowing with force into the lungs, by applying the mouth to that of the patient, closing at the same time his nostrils; rubbing the belly, chest, back, and arms with a coarse cloth, or dry salt, so as not to rub off the skin, or with a flannel dipped in brandy, rum, or gin; applying volatile salts or the like to the nostrils, and rubbing them on the temples frequently; tickling the throat with a feather, to excite a propensity to vomit, and the nostrils also with a feather or snuff to provoke sneezing. The body should at intervals be shaken, and varied in its posture.

IV If there be any signs of life, such as sighing, gasping, twitching beating of the heart,

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return of natural warmth and color, a spoonful of water may be administered, to try if the power of swallowing be returned; if it be a spoonful or two of warm wine, or of brandy and water, may be given to advantage but not before.

Early bleeding has been found pernicious, and even fatal; it is not always applicable, though it may sometimes be employed by a person of skill, to remove or prevent symptoms of inflammation.

The above methods of restoring life are applicable to various other cases of apparent sudden death, whether from hanging, apoplectic and convulsive fits, cold, suffocation by damps or noxious vapours, proceeding from coal mines, confined air of wells, caverns, cisterns or from the must of fermented liquors.

We have thus endeavoured to

unfold this important subject and we can but lament, with every friend of humanity, that where so much was to be done, so little has been accomplished, near a century has rolled its eventful tide of time, since our subject was first introduced to the attention of the medical world, the means which are now used are simple, and must have been obvious to the first medical enquirer. "let every thing however be attempted, and should every thing fail, let the practitioner at least deserve success."—

1819

Rise, progress &c of present State of
Medicine
C. Rodfield